

**REMARKS**

Claims 2-16 and 19-40 have been withdrawn from consideration and are cancelled without prejudice. Claim 48 has been added, examples of the support for which can be found at page 35 lines 6-10, page 36 lines 1-11, and original claim 43. Claims 1, 17, 18 and 41-48 remain in the application for examination and reconsideration.

**§ 112 Rejections**

Claims 1, 17, 18, 41-46 stand rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The Examiner stated that claim 1 was not enabled; the specification suggests as Examiner is familiar with, formation of poly-urethanes from polyols, but claim 1 requires only a vinyl compound, no  $\alpha$ L at all, thus would not result in a polyurethane.

Applicants note that claim 1 requires a "polymeric composition, comprising, a polyurethane polymer derived from a polyisocyanate compound and a polyactive hydrogen compound, said polyurethane polymer at least partially endcapped with a group including at least one antimicrobial quaternary ammonium group, said polymeric composition capable of forming a self supporting film."

The polyactive hydrogen compound recited in claim 1 provides the  $\alpha$ ol material. See, e.g., specification as filed page 4 lines 7-9. In the specification, a "polyactive hydrogen compound" is defined as "a polyfunctional compound having more than one active hydrogen moiety capable of a reaction with an isocyanate moiety." Further, it is noted that claim 1 specifically recites a polyurethane polymer. As also noted in the specification, "Polyurethane" refers generally to the reaction product of a polyisocyanate and a polyol.

Thus, it is believed that the rejection of claims 1, 17, 18, 41-46 under 35 U.S.C. § 112, first paragraph, has been overcome, and that the rejection should be withdrawn.

**§ 102 Rejections**

I. Claims 1, 41-44 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Wang et al. '98.

The Examiner stated that Wang described "self-supporting" films "partially endcapped" with a quaternary antimicrobial group that is pendant to the structure (Office Action page 3). The Examiner stated that Wang described a polymer composition useful to treat solids (fibers), articles (coated fabrics) for medical use, aqueous dispersions to provide films, and coated fabrics (see id.).

In response to the arguments previously submitted by applicants, the Examiner simply stated that "claim 1 is to a derived polymer with certain capabilities; the prior art as cited 5/13/02 met these products and capabilities." However, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Thus, for there to be anticipation, "the identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Wang describes a polyurethane prepolymer that is chain-extended with diethylenetriamine to form a polyurethane polymer (see Abstract). Wang then grafts epichlorohydrin onto the polyurethane polymer to form a "reactive polyurethane solution" (see equations on page 178). It is this pendant epichlorohydrin that is then reacted with the biocide (see equation on page 179). Contrary to the Examiner's assertion, the equation on page 179 does not show a polyurethane polymer **endcapped** with a quaternary ammonium group. Rather, Wang clearly shows and describes a polyurethane polymer having epichlorohydrin bonded to the polyurethane backbone, with the biocide bonded to the epichlorohydrin.

In contrast, claim 1 requires, *inter alia*, a polyurethane polymer "at least partially endcapped with a group including at least one antimicrobial quaternary ammonium group" (claim 1). That is, the main chain of the polyurethane polymer **itself** is endcapped in the invention defined by claim 1.

The Examiner's argument does not explain how Wang provides the biocidally-endcapped polyurethane required by applicants' claims. Thus, it has not been shown that Wang describes each and every element of the present invention in as complete detail as is contained in claim 1.

The rejection of claims 1 and 41-44 under 35 U.S.C. § 102(b) as purportedly being anticipated by Wang is therefore unwarranted and should be withdrawn.

II. Claims 1 and 41-45 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Stovicek (5,084,096).

The Examiner stated that the Stovicek claims describe a polyurethane treated with quaternary biocidal end groups to provide films, coatings, and articles (see previous Office Action p. 4). The Examiner also stated that an alkylene group attached the quaternary moiety to the polymer chain citing col. 2 and example 4 (see id.). Again, in response to the arguments previously submitted by applicants, the Examiner simply stated that "claim 1 is to a derived polymer with certain capabilities; the prior art as cited 5/13/02 met these products and capabilities."

Referring to claim 1, it is important to note that Stovicek describes the resins as having "directly bonded to their backbone repeating side chains of an active microbiocidal quaternary ammonium radical." Similarly, the general formula and description in col. 2 of Stovicek describe a pendant chain "directly bonded to the polymer backbone" (col. 2 lines 15-27), and Example 4 of Stovicek (specifically referred to by the Examiner in the previous Office Action) describes epoxies, not the polyurethane polymers claimed by applicants. Thus, Stovicek clearly requires the bonding of active microbiocidal quaternary ammonium radical directly to the polymer backbone. As discussed above with regard to Wang, this does not fulfill the antimicrobial endcapped polyurethane polymer requirement of claim 1 of the present invention. Applicants are unable to find any description in Stovicek of a polyurethane polymer at least partially endcapped with a group including at least one antimicrobial quaternary ammonium group, and the Examiner does not even argue that such structure is disclosed in Stovicek.

As Stovicek does not describe each and every element, it does not anticipate the invention defined in claim 1. Thus, the rejection of claims 1 and 41-45 under 35 U.S.C. § 102(b) as purportedly being anticipated by Stovicek is unwarranted and should be withdrawn.

**§ 103 Rejections**

Claims 1, 17, 18, 41-47 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Klesse et al. (6,194,530) in view of Stovicek and further in view of Imazato et al. (5,408,022) and Green et al. (3,931,319).

The Examiner stated that Klesse provided the chain linking vinyl and quaternary antimicrobial groups to provide antimicrobial efficacy to polymers "inclusive of polyurethanes" (citing claim 1). The Examiner acknowledged that Klesse did not teach the quaternary moiety as an end group and that Klesse did not recite polyurethane formation.

The Examiner added Stovicek for the use of quaternary compounds for biocidal polymers including their use in medical devices, coatings, and shaped articles (col. 7 lines 9-44). Then the Examiner stated that Imazato described the instant vinyl as urethane polymerization units (col. 11, lines 12-19, Exs. 2-6 col. 12). The Examiner stated that Green described determining polymer length by capping with a quaternary ammonium moiety (cols. 1, 2).

In response to the arguments submitted previously by applicants, the Examiner stated that "Klesse is at least as good as applicants [sic] claimed polyurethane, in the poly active hydrogen mode, requiring no polyols, as far as examiner can determine." The Examiner concluded that "[t]he reference would be known and within the purview of one in the art to utilize the advantages thereof."

Of course, whether or not Klesse is "at least as good" as applicants' claimed polyurethane is irrelevant. As acknowledged by the Examiner, Klesse does not describe, teach, or suggest polyurethane polymers. Claim 1 requires, *inter alia*, a polyurethane polymer derived from a polyisocyanate compound and a polyactive hydrogen compound, which is defined as a polyfunctional compound having more than one active hydrogen moiety capable of a reaction with an isocyanate moiety. Klesse does not describe the claimed polyurethane polymer. As importantly, and as further acknowledged by the Examiner's argument, Klesse does not teach the quaternary ammonium as an end group. Thus, Klesse can hardly be said to disclose the essence of the claimed invention as asserted in the Examiner's argument.

The Examiner's argument adds Stovicek for its disclosure of quaternary compounds as biocidally effective in polymers. As discussed above, Stovicek also lacks any description of a polyurethane polymer at least partially endcapped with a group including at least one

antimicrobial quaternary ammonium group. Thus, the combination of Klesse and Stovicek lacks the required polyurethane polymer at least partially endcapped with a quaternary ammonium group, as required in all claims of the present invention.

Imazato is relied upon for its teaching of a vinyl in urethane polymerization, citing col. 7 line 66 through line 63 of col. 8. However, Imazato describes only "urethane(meth)acrylic acid" and "urethane(meth)acrylates" in col. 7, not polyurethane polymers. Further, Imazato describes reacting a diisocyanate with a methacrylate having a hydroxyl group to form a "tri- or more functional monomer" (col. 8 lines 41-60). The Examiner's argument does not show how this provides the polyactive hydrogen compound or the polyurethane polymer required by the present invention. This combination still fails to show the required polyurethane polymer at least partially endcapped with a quaternary ammonium as required in all claims of the present invention.

Green is cited for teaching capping of a polymer with a quaternary ammonium moiety (see Previous Office Action p. 5). Green is directed to linear quaternary ammonium polymers (see col. 1 lines 4-8). The Green chemistry involves reacting a dihaloalkene (*e.g.*, 1,4-dichloro-2-butene) with a difunctional tertiary amine to extend the chains and a monofunctional tertiary amine to end the chains (see col. 1 line 67—col. 2 line 7). Thus, "the quaternary ammonium moieties are part of the linear polymeric chain" (col. 1 lines 5-7). The Examiner's argument shows no motivation or suggestion in Green to endcap a polyurethane polymer. As with the other references, Green fails to show the required polyurethane polymer at least partially endcapped with a quaternary ammonium group, as required in all claims of the present invention.

Moreover, the consistent criterion for a determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art the claimed invention and that it would have had a reasonable likelihood of success, viewed in the light of the prior art. *In re Dow Chemical Co.*, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988). The Examiner's argument does not show any likelihood of success in combining these chemistries and thus provides no reasonable expectation of success in reaching the claimed invention. An attempt is made to combine selections from the free radical polymerization methods of Klesse and Imazato for non-polyurethane polymers with the stepwise polymerization of Stovicek, and then somehow add the Green tertiary amine polymerization followed by chain termination.

The Examiner's argument lacks any suggestion in the art to combine selected features from different chemistries in the manner defined by applicants' claims. Absent a showing of a suggestion to combine in the prior art, the applicants' teaching has been impermissibly used to hunt through the prior art for the claimed elements and combine them as claimed. *In re Laskowski*, 10 USPQ 2d 1397, 1398 (Fed. Cir. 1989). These references are devoid of any suggestion of the advantages of providing a polyurethane polymer endcapped with a quaternary ammonium group. The only source of the noted advantages of the claimed polyurethane polymer is *applicants' specification*, and it is improper to use this as the purported motivation for combining the references. *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Finally, even if was proper to combine particular features from these four references, the resulting combination would not be a polyurethane polymer, as defined by claim 1. To the extent one might guess how these references could be combined, the result would at best be the non-polyurethane polymer of Klesse terminating in the quaternary ammonium moieties of Green. Such a combination still lacks a polyurethane polymer derived from a polyisocyanate compound and a polyactive hydrogen compound at least partially endcapped with a quaternary ammonium group, as defined by claim 1.

For all of these reasons, the invention defined by claim 1 is patentable over the cited references. As claims 17, 18, and 41-45 depend from claim 1, these claims are also patentable for the same reasons. The rejection of claims 1, 17, 18, and 41-45 under 35 U.S.C. § 103 as purportedly being unpatentable over Klesse in view of Stovicek and further in view of Imazato and Green is unwarranted and should be withdrawn.

In view of the above, it is submitted that the application is in condition for allowance. Reconsideration of the application is requested.

Respectfully submitted,

18 Apr 03  
Date

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1004211/002 AMEND 2

**Version with markings to show amendments made:****In the Specification**

**In the paragraph bridging pages 1 and 2, please amend to fix the typographical error:**

Various attempts have been made to overcome these deficiencies by chemically bonding the active antimicrobial substance to the polymeric coating. Polysiloxane polymers having pendant quaternary ammonium salts are disclosed by Nohr, et al., U.S. Patent No. 5,569,732 and Gettings et al., U.S. Patent No. 5,013,459. The polymers disclosed in these patents have been applied to fibers, non-woven fabrics and glass or ceramic surfaces. Polymers and copolymers from vinyl benzene having [quaternary] quaternary ammonium salt groups have been disclosed by Sheldon, et al., U.S. Patent No. 4,532,128 for use with various medical and personal care products.

**In the paragraph on page 6 from line 20 through line 28, please amend to fix the typographical error:**

In certain embodiments the [quaternary] quaternary ammonium groups are covalently bound to water insoluble polymeric backbones making the antimicrobial non-leaching and thus providing persistent antimicrobial protection to a surface to which it is applied. This eliminates the need to periodically replenish the antimicrobially active substance for the life of the coating. Further, by immobilizing the antimicrobial substance as part of the coating, there is no release of potentially harmful substances to the environment during use. This is particularly desirable if the coating is used outdoors or if a particular use is likely to result in contact with humans or other higher life forms.

**In the paragraph on page 10 from line 10 through line 21, please amend to fix the typographical errors:**

In a further reaction scheme contemplated by the claimed invention, a polyol compound having vinylic functionality undergoes a reaction with a polyisocyanate to form a polyurethane prepolymer having excess isocyanate groups. A monol having a quaternary ammonium group may be added to at least a portion of the residual isocyanate groups. This intermediate polymer

has vinylic functionality which can be combined with a quaternary ammonium compound having vinylic functionality by means of addition polymerization. The resulting [isocyanate] isocyanate functional polyurethane can be chain lengthened to provide a polyurethane polymer with biocidal properties. It should be noted that the chain [lengthing] lengthening (i.e. chain extension) step can be performed before or after the vinyl polymerization. The inventors presently prefer to conduct the chain extension step followed by the vinyl polymerization reaction.

**In the paragraph on page 11 from line 11 through line 27, please amend to fix the typographical error:**

Suitable polyisocyanates include organic compounds containing at least two free isocyanate groups. Diisocyanates of the formula  $D(NCO)_2$  are preferably used wherein D denotes an aliphatic hydrocarbon group with 4 to 20 carbon atoms, a cycloaliphatic hydrocarbon group with 6 to 20 carbon atoms, an aromatic hydrocarbon group with 6 to 20 carbon atoms or an araliphatic hydrocarbon group with 7 to 20 carbon atoms. Diisocyanates (as well as difunctional polyactive hydrogen compounds) are preferred in order to ensure that the final polymer formulations are capable of forming films upon drying. If the crosslink density is too high film formation will not be possible. Preferred polymer solution or [dispserion] dispersion compositions upon drying (removal of solvent) coalesce sufficiently to form a self forming film at temperatures less than 50°C and preferably temperatures less than about 30°C. Most preferred polymer compositions are capable of forming a self supporting film at room ambient temperature (23-25°C). Characteristically these preferred materials are generally thermoplastic polymers. As used herein "self supporting" means that when the composition is dried down onto a release liner of suitably low surface energy, the film so formed once removed from the release liner is capable of supporting its own weight.

**In the paragraph on page 29 line 27 through page 30 line 5, please amend as follows. Support is found in the specification as filed, for example, in claim 43.**

Coatings produced from compositions of the present invention are suitable for any surface subject to deterioration or discoloration from microorganisms such as algae, mold, fungi, or bacteria. For example, construction materials such as roofing felts or lumber may discolor or decay over time if used in a moist environment. Other substrates include roofing shingles,



roofing granules, tile, concrete, metal, polymers, cloth, fibers, and wood. The coatings may also be applied to inanimate surfaces in health care facilities to mitigate the spread of pathogenic organisms. Surfaces include hard surfaces such as walls, floors, furniture, food trays and “soft” surfaces such as bedding, uniforms and linen supplies. The coatings may also be applied to wound dressings on or in an absorbent pad, catheters and other in-dwelling devices, medical drapes, surgical sponges, diapers and the like to prevent microbial growth.

**In the paragraph on page 36 from line 12 through line 18, please amend to fix the typographical errors:**

The films obtained from dispersions of Examples 1 and 3 were very hydrophobic, however, prolonged immersion of films in the water[,] caused them to absorb some water. Nevertheless, these films [loose] lost water quickly [as soon] when they were removed from the water. The water absorption affinity of films depends on the concentration of low molecular weight solubilizing salt and types of soft segments in the prepolymer chain. The following test method is to determine the water absorption of films: